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Prevalence, Geographic Variation, and Trends in Hospital Services Relevant to the Care of Older Adults: Development of the Senior Care Services Scale and Examination of Measurement Properties

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Abstract

Background—The availability of hospital services for older adults nationwide is not well understood.

Objective—Present the development of the Senior Care Services Scale (SCSS) through: (1) identification of hospital services relevant to the care of older adults; (2) development of a taxonomy classifying these services; and (3) description of prevalence, geographic variation, and trends in service provision in US hospitals over time.

Design, Setting, and Participants—Retrospective cohort study of US hospitals in 1999 and 2006 rounds of American Hospital Association Annual Survey of Hospitals, (n= 4,998 and 4,831 hospitals, respectively). Exploratory factor analysis was used to create the SCSS, and confirmatory

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factor analysis was used to examine services over time. The paper reports prevalence of services nationwide.

Results—The SCSS consisted of two service groups: (1) Inpatient Specialty Care (IP): geriatrics, palliative care, psychiatric geriatrics, pain management, social work, case management, rehabilitation, and hospice; and (2) Post-acute Community Care (PA): skilled nursing, intermediate care, other long-term care, assisted living, retirement housing, adult day care, and home health services. Over time, hospitals offered more IP services and fewer PA services. The distribution of services did not mirror the distribution of where older adults reside in the US.

Conclusions—The development of the SCSS provides important information about senior care services prior to the passage of the Affordable Care Act. The apparent mismatch of hospital services and demographic trends suggests that many US hospitals may not provide a seamless continuum of care for an increasing population of older adults.

Keywords

health care surveys; factor analysis; American Hospital Association; frail elderly; health services for the aged

Introduction

Hospitals have compelling reasons to provide high-value care to older adults.¹ High-value care achieves better outcomes at lower costs, and providing tailored services for resource-intensive patients is an important component of high-value care.² The Department of Health and Human Services announced that by 2018, 90% of fee-for-service Medicare payments will be tied to quality or value of care.^{3,4} By 2030 adults aged 65 years and older will constitute nearly 20% of the population.⁵ Older adults are hospitalized at a higher rate than the general population and account for over 40% of all healthcare dollars spent on hospitalization in 2011.^{6,7} The Affordable Care Act (ACA) calls for increased accountability of hospitals for patients' outcomes.⁸ Since older adults transition frequently across healthcare settings,⁹⁻¹³ coordinated services relevant to their care is important in an era of accountability. Older adults are at especially high risk for safety problems during and after hospitalization and benefit from specific services targeted towards their needs.¹⁴⁻¹⁷

Despite these important trends, the taxonomy and availability of services relevant to the care of older adults in hospitals has not been examined in decades. In the 1980s, Evashwick and Alexander, et al. described the range of services hospitals provide to older adults^{1,18,19} and found that “outreach services” extending hospital programs and activities to the community identified serious commitment to robust geriatric service provision. However, prior taxonomies of services outlined in these papers may be obsolete, given the substantial changes in healthcare over the last 20 years.

The goal of this paper is to present the development of the Senior Care Services Scale (SCSS), which provides a framework for healthcare systems to evaluate how they are organizing and integrating hospital services relevant to the care of older adults. This paper describe the process of: (1) identification of relevant hospital services; (2) development of a

taxonomy to classify these services; and (3) description of the prevalence, geographic variation, and trends in service provision in US hospitals over time.

Methods

A multi-step process was used to develop the SCSS (Figure 1): (1) selection of hospital services relevant to the care of older adults; (2) expert review of those hospital services and selection of potential services for inclusion in the SCSS; (3) grouping of the selected services using exploratory factor analysis (EFA) to develop the SCSS taxonomy; and (4) validation of the structure of the taxonomy using confirmatory factor analysis (CFA); and 5) description of prevalence, geographic variation, and temporal trends in service provision. This study was approved by a Johns Hopkins School of Medicine Institutional Review Board.

Data source

This was a retrospective cohort study using the 1999 and 2006 rounds of the American Hospital Association Annual Survey of Hospitals (ASH). The ASH is the most comprehensive data source on US hospital characteristics, representing over 75% of US hospitals.²⁰ It contains over 700 self-reported items on characteristics and services offered (owned or provided by the hospital itself or a subsidiary). The following hospitals were excluded: survey non-responders (7%); children's hospitals (2%); and specialty hospitals (22%). The analytic sample consisted of 4,998 hospitals in 1999 and 4,831 in 2006.

Selection of initial hospital services for consideration

To identify hospital services relevant to the care of older adults, authors AA and BL reviewed all 93 services listed in the ASH and selected 78 services that were either supported by the literature or by clinical experience as at least generally related to domains of our conceptual framework (Figure 1, Step 1). The domains in our conceptual framework were derived from those identified in specific studies on geriatric services,^{1,18,19} other literature,^{21,22} and clinical experience: inpatient medical services, discharge planning services, integration with post-acute care, services to improve access to care, health maintenance and support, and organizational characteristics. We removed services that were either not targeted towards an adult population (e.g., neonatal intensive care), or were specialized technologies geared to specific needs (e.g., stereotactic radiosurgery). See Table, Supplemental Digital Content 1, **for selected examples of hospital services considered for inclusion in the SCSS.**

Expert review of hospital services

In an iterative process, geriatrics healthcare professionals at our institution reviewed and rated each of the 78 services within each domain on a 4-point Likert scale (“not at all,” “very little,” “somewhat,” “to a great extent”) based on their opinion of the likelihood of these services being relevant to the care of older adults (Figure 1, Step 2). Three focus groups each lasting 45-60 minutes were conducted with a total of 25 geriatrics healthcare professionals, including physicians, nurses, and home healthcare practitioners. Participants practiced in settings spanning the continuum of care older adults experience: hospital,

skilled nursing facility, ambulatory care, assisted living, long-term care, home **health care**, and hospice. We asked participants to 1) recall successful and suboptimal care transitions of older adults out of the hospital, 2) discuss which services were relevant during the transition, and 3) rate services. In all, 33 services were selected as relevant to the care of older adults (average overall rating across all 3 focus groups of “somewhat” or “to a great extent”).

Development of SCSS taxonomy

An exploratory factor analysis (EFA) of the 33 services was performed using 2006 data to identify the best items for inclusion in the SCSS (Figure 1, Step 3). We **created a binary variable (yes/no) that** credited the hospital as having a service if the service was provided by the hospital or its subsidiary. Geometric mean rotation was used assuming polychoric correlation among service groupings. Services were dropped if any of the following criteria was met: (1) low amount of variation explained; (2) individual service correlation with overall services < 0.20 ; (3) high correlation with other services (> 0.80); (4) low reliability (no improvement of Cronbach's alpha when including the service in the model); or (5) modification indices > 10.0 . Information based on our conceptual framework, Scree plots, and Eigen values was used to decide the number of factors (service groupings) in the analysis. McDonald's Omega²³ was calculated to assess internal reliability, given the limitations of using Cronbach's alpha.²⁴

Comparison of SCSS taxonomy across time

In order to assess the change in SCSS service groupings over time, hospital service statistics and service grouping scores were compared between years 1999 and 2006. Confirmatory factor analysis (CFA) was performed to validate SCSS structure and verify if the number of factors (service groupings) and the relationships among hospital services and service groupings that were found in 2006 data were the same in 1999 data (Figure 1, Step 4).

CFA was first undertaken to assess the factors describing hospital characteristics, for years 1999 and 2006 separately. Models with and without cross-loadings were compared, and the difference was tested using a Chi-square test. Next we conducted multi-sample CFA to examine whether the SCSS structure (service groupings) was equivalent across the years 1999 and 2006. We employed a multistep analysis of invariance. The first step was to establish a non-constrained model in which only the form of the model was tested for invariance. In the next steps, the factor loadings, the factor covariance matrix, and the uniqueness were set to be invariant across years step by step. The following were examined to assess goodness of fit: factor loadings, factor and error variances, modification indices, and measures of overall fit (comparative fit index (CFI), Tucker-Lewis index (TLI), weighted root mean square residual (WRMR) and root mean square error of approximation (RMSEA).²⁵⁻²⁷ McDonald's Omega²³ was calculated to assess model-based reliability.

Description of the prevalence, geographic variation, and trends in service provision in US hospitals over time

The distribution of service groupings in US hospitals was then analyzed by hospital referral region (HRR), a classification system developed by Dartmouth Atlas researchers.²⁸ To examine hospital characteristics related to provision of services relevant for older adults,

ANOVAs were performed for each service group. To adjust for multiple comparisons, the significance level (α) was set to be 0.003 using Bonferroni's correction.

Results

Taxonomy of hospital services relevant to the care of older adults

Item reduction resulted in the SCSS with 15 items. For the sample correlation matrix, the first three Eigen values were 4.50, 2.81 and 1.46, explaining 58% of the total variance. In EFA procedures, we studied both a two-factor model and a three-factor model. The two-factor model provided factors that were more interpretable and better defined compared to the three-factor model. The three-factor model included items that conceptually did not belong in the same category. This (Figure 1, steps 1-3) resulted in the SCSS with two main service groups: an 8-item Inpatient Specialty Care (IP) group and a 7-item Post-acute Community Care (PA) group. Table 1 shows the service groups and factor loadings of services within each of the two groups. Factor loadings represent the strength of the linear relationship between each service grouping (factor) and the hospital services within each grouping.²⁹ The IP group (factor 1) was comprised of items related to specialty services primarily delivered in a hospital setting: geriatrics, palliative care, psychiatric geriatrics, pain management, social work, case management, rehabilitation, and hospice. The PA group (factor 2) was comprised of items related to services delivered in the post-acute care setting: skilled nursing, intermediate care, other long-term care, assisted living, retirement housing, adult day care, and home health services. Hospice and home health services exhibited cross-loading on both factors. **See Table, Supplemental Digital Content 2, which describes the definition of the hospital services related to older adults in the SCSS.**

Inter-correlation of the two service groups was calculated (Table 1), and a low correlation was found (0.18), indicating the groupings were distinct from each other. Omega coefficients for both groups were calculated for internal reliability. None of the coefficients indicated poor internal reliability (Inpatient = 0.70; Post-acute = 0.62).

Description of the prevalence, geographic variation, and trends in service provision in US hospitals over time

The 1999 and 2006 rounds of the ASH included 4,998 and 4,831 US hospitals, respectively. In both 1999 and 2006, approximately 28% of hospitals were government-owned, 57% were non-profit, and 15% were for-profit. Twenty percent of hospitals were teaching hospitals, and of these approximately 28% were government-owned, 64% were non-profit, and 7% were for-profit. There was a slight increase in the number of smaller hospitals (< 100 beds: 45% to 47%), with a concomitant decrease in the number of mid-sized hospitals (100-299 beds: 39%-36%). Mean occupancy rate was about 57% and relatively unchanged between the time periods. From 1999 to 2006, there was a significant increase in the proportion of hospitals with high numbers of Medicare discharges (defined as > 3000 average discharges per year, 82.1% to 86.6%, respectively).

Average factor scores across hospitals varied by hospital characteristics. Hospitals with the following characteristics had higher mean IP and PA scores: teaching hospitals (vs. non-

teaching), and hospitals with ≥ 200 beds (vs. < 200 beds). Hospitals with the following characteristics had higher mean IP scores: non-rural (vs. rural), non-profit hospitals (vs. for-profit or government-owned), and hospitals with moderate numbers of Medicare discharges per year (1000-3000) vs. low (< 1000) or high (> 3000) discharges. Hospitals with the following characteristics had higher mean PA scores: rural (vs. non-rural), low or moderate number of Medicare discharges per year (vs. high), and non-profit or government-owned hospitals (vs. for-profit). These differences between means were significant at $p < 0.03$ or less.

Table 2 depicts the proportion of US hospitals offering hospital services relevant to the care of older adults in 1999 and 2006 by IP and PA service groups. Compared to 1999, more hospitals in 2006 offered the following services: palliative care (28.4 % vs. 19.5%, $p < 0.001$), pain management (47.1% vs. 41.3%, $p < 0.001$), case management (81.3% vs. 64.7%, $p < 0.001$), and rehabilitation (30.1% vs. 26.9%, $p = 0.001$). Compared to 1999, fewer hospitals offered the following services relevant to older adults: geriatric psychiatry (29.9% vs. 32.8%, $p = 0.002$), skilled nursing facility care (29.6% vs. 39.1%, $p < 0.001$), adult day care (6.4% vs. 10.1%, $p < 0.001$), and home health services (33.4% vs. 45.8%, $p < 0.001$). There were no significant differences in hospitals' factor scores between the two years, indicating the relationships between the hospital services and their corresponding service groupings did not change significantly between 1999 and 2006.

The IP and PA service groups were not distributed evenly across hospitals nationwide. Figure 2 demonstrates the distribution of IP and PA services by HRR. The categories represent factor score quartiles, which indicate a hospital's relative standing on IP and PA services, respectively. Darker areas on the map represent HRRs with hospitals that have more IP or PA services, compared to lighter areas representing HRRs with hospitals that have fewer IP or PA services. Both IP and PA services were concentrated in the northern part of the US and in some metropolitan areas, which based on a comparison with US Census data did not mirror a map of the distribution of where older adults resided in the US (see Figure, Supplemental Digital Content 3, **which depicts the percentage of the population aged 65 years and older across the United States**).⁵

Comparison of SCSS taxonomy across time

Multi-sample CFA was performed to validate SCSS structure and verify whether the number of factors (service groupings) and the relationships among hospital services and service groupings found in the 2006 data were the same in the 1999 data (Figure 1, Step 4).

Table 3 depicts goodness of fit data and comparison of models for the difference between years 1999 and 2006. Model B is the two-factor model without cross-loadings. In Model A, besides the original items, there are items that have cross-loadings of hospice service indicator and home health services indicator on both factors. Since Model B was nested in Model A, we were able to test the significance of difference between models using a Chi-square test. In both 1999 and 2006, significant p-values suggested the model with item cross-loading (Model A) provided better fit. In addition, better fit was observed for Model A, as evidenced by criteria such as RMSEA, CFI and TLI. Cross-loadings of the hospice service indicator and home health services indicator were also confirmed by high

Modification Indices in Model B. **The cross-loadings also made conceptual sense, since hospice and home health services are generally delivered over time and may span more than one episode of acute care.** We chose Model A as our final model. Table 3 also gave the most reasonable model (equal form, non-invariant loadings), with constraint on equal factor loadings. This suggested that in the two years there was an invariant factor pattern, but there were differences in error variances and in factor covariance matrices. For this model, Omega was calculated to assess reliability. It was 0.75 for Inpatient Specialty Care and 0.72 for Post-acute Community Care, indicating that less than 30% of the error is due to measurement error.

In further analysis, the correlations between the two groupings were calculated to be 0.53 and 0.40 for years 1999 and 2006, respectively. This suggested the IP and PA service groupings represented more distinct concepts in 2006 than in 1999. That is, the groupings represented more clearly separate categories serving different needs over time.

Discussion

To our knowledge, this is the first study to evaluate the services hospitals offered nationwide to older adults since the mid-1980s.^{1,18} Studies during that time found that offering “outreach services,” defined as those that extended hospital activities to the community, best identified hospitals’ strong commitment to senior care, because they required commitment of capital beyond standard inpatient care. The services that comprise the SCSS’s PA grouping share some of conceptual features of “outreach services” from previous taxonomies.

The SCSS represents an important development for organizations and policymakers interested in organizing, integrating, and tracking care for older adults. We believe this is especially relevant in the context of the development of accountable care organizations and other value-based care initiatives that will by necessity involve the care of older adults. The SCSS is meant to provide a framework for healthcare systems to use to evaluate how they are organizing and integrating hospital services relevant to the care of older adults. The SCSS would also be valuable for research purposes, as it is a scale that can be used to monitor trends in the provision of services to older adults on a local, regional, or national scale. There are several advantages to the SCSS: (1) it was developed through a systematic process, based on a conceptual framework, employing qualitative and quantitative methods and involving those who routinely care for older adults; (2) it is more parsimonious than prior taxonomies; (3) it uses data that currently exists in the ASH; and (4) the data are readily available to hospitals, organizations, researchers, payers, and policymakers. Additionally, IP and PA service groupings became more distinct from each other over time, representing more clearly separate categories serving different needs. Healthcare organizations or other key stakeholders who do not have easy access to ASH data could consider using other data as an acceptable substitute if the data definitions are similar to those in the ASH (please see supplemental digital content).

Strikingly, despite the growing number of older adults and those with complex needs, fewer hospitals offered PA services over the time period of study. Overall, hospitals increased IP services over time. Changes to hospital reimbursement in the late 1990s from fee-for-service

to prospective payment likely influenced hospitals offering more IP services and fewer PA services over time. This may be because IP services are more squarely within the locus of control of hospitals and do not require the same level of community engagement as does provision of PA services. Rural hospitals may consider PA services to be more critical for their patient population that may have a limited ability to access healthcare services due to geography. Also striking was that hospitals with high numbers of Medicare discharges offered fewer PA services, and the distribution of IP and PA services did not mirror the distribution of where older adults reside in the US. The apparent mismatch of hospital services and demographic trends of potential users of these services suggests that US hospitals may not have a seamless continuum of care for an increasing population of older adults.

This study must be interpreted in the context of several limitations. The ASH data (1) are self-reported, (2) contain information only on presence or absence of hospital services, and (3) do not reflect the availability of community resources not affiliated with hospitals and thus not captured in the ASH. Though the data are from 2006, the SCSS groupings were stable over the 7-year period of analysis. Additionally, not all SCSS services are specific to older adults. Further research is needed to determine if the SCSS is associated with outcomes important to older adults and health systems. Despite these limitations, the development of the SCSS remains relevant because it provides important baseline information on senior care services in US hospitals prior to the passage of the ACA.

There are important implications in the context of the implementation of the ACA, which encourages the creation of accountable-care organizations (ACOs) and partnerships with community-based organizations to deliver quality care after hospital discharge. Hospitals offering fewer PA services may be less prepared to participate in ACOs compared to hospitals offering more PA services. Though hospitals offer more IP services over time, these hospitals may not necessarily enhance care coordination without a concomitant increase in PA services to link older adults back to the community after hospital discharge.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Multi-step process to develop SCSS

SCSS: Senior Care Services Scale

ASH: Annual Survey of Hospitals

EFA: Exploratory factor analysis

CFA: Confirmatory factor analysis

Inpatient Specialty Services

- >75th Percentile (Above 0.320)
- 25-75th Percentile (0.161 to 0.320)
- < 25th Percentile (-0.338 to 0.160)

Distribution of Post-Acute Community Services, by Hospital Referral Region

Post-Acute Community Services

- >75th Percentile (Above 0.080)
- 25-75th Percentile (-0.039 – 0.080)
- < 25th Percentile (-0.327 - -0.039)

Figure 2. Distribution of Inpatient Specialty Care and Post-Acute Community Services in 2006, by Hospital Referral Region

Table 1
Senior Care Services Scale (SCSS) of hospital services related to older adults resulting from confirmatory factor analysis (n=4,998)

Taxonomy Classification	Hospital Service	Description	Factor loading	
			Inpatient Specialty Care	Post-acute Community Care
Factor 1: Inpatient specialty care	Palliative care program	Services for those with advanced disease	0.84	
	Pain management program	Management of acute or chronic pain	0.82	
	Social work	Assistance with social problems associated with illness	0.69	
	Geriatric services	Specialized treatment of diseases affecting the aged	0.63	
	Case management	Assessment, treatment planning, follow-up services	0.56	
	Hospice	Services focused on symptom relief and emotional needs of those with terminal illness	0.55	0.36
	Psychiatric geriatric care	Care for older adults with concurrent mental illness	0.53	
	Rehabilitation care	Services to achieve maximum functional capacity	0.42	
Factor 2: Post-acute community care	Assisted living	Housing and supportive services for those needing help with activities of daily living		0.77
	Retirement housing	Housing and social activities for older adults not requiring help for activities of daily living		0.77
	Skilled nursing care	Non-acute nursing care, therapy, and social services under 24-hour supervision		0.71
	Intermediate care	For those who do not need skilled nursing care but require supervision		0.61

Taxonomy Classification	Hospital Service	Description	Factor loading	
			Inpatient Specialty Care	Post-acute Community Care
	Adult day care	Activities for those who live elsewhere but need supervision during the day		0.56
	Other long-term care	Long-term care other than skilled nursing care or intermediate care, such as group homes		0.51
	Home health services	Nursing, therapy, and aide services delivered in the home	0.31	0.44
Correlation between factor1 and factor2			0.18	

Table 2
Proportion of US hospitals offering services relevant to older adults and trends over time

Taxonomy Classification	Hospital Service	Percentage of US Hospitals		<i>p</i> -value for difference
		1999 (n=4,998)	2006 (n=4,831)	
Factor 1: Inpatient specialty care	Palliative care program	19.5	28.4	<0.001
	Pain management program	41.3	47.1	<0.001
	Social work	84.9	85.0	0.82
	Geriatric services	39.9	38.4	0.13
	Case management	64.7	81.3	<0.001
	Hospice	24.6	23.1	0.08
	Psychiatric geriatric care	32.8	29.9	0.002
	Rehabilitation care	26.9	30.1	0.001
Factor 2: Post-acute community care	Assisted living	4.6	4.8	0.54
	Retirement housing	3.3	3.5	0.73
	Skilled nursing care	39.1	29.6	<0.001
	Intermediate care	9.7	9.7	0.94
	Adult day care	10.1	6.4	<0.001
	Other long-term care	6.1	6.7	0.22
	Home health services	45.8	33.4	<0.001

Table 3

Confirmatory factor analysis: Goodness of fit and comparison of models for difference between years 1999 and 2006.

Year	Model	χ^2	df	χ^2	df	RMSEA	WRMR	CFI	TLI
1999	A	1403.17	87			0.056	3.225	0.86	0.83
	B	1978.45	89	375.72	2	0.066	3.857	0.80	0.76
2006	A	1528.37	87			0.058	3.512	0.89	0.87
	B	2300.89	89	406.56	2	0.072	4.322	0.83	0.80
Equal form, non-invariant loadings		2934.38	174			0.057	4.768	0.88	0.85
Overall, measurement invariance		3351.931	187			0.059	5.24	0.86	0.84

Model A: two-factor model with cross-loadings of hospice indicator and home health indicator on both factors

Model B: two-factor model without cross-loadings of hospice indicator and home health indicator

RMSEA: root mean square error of approximation

WRMR: weighted root mean square residual

CFI: comparative fit index

TLI: Tucker-Lewis index